

Laparoscopic-Assisted Percutaneous Endoscopic Transgastrostomy Jejunostomy

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ABSTRACT

Background and Objectives: New therapeutic protocols for patients with end-stage Parkinson disease include a carbidopa/levodopa combination using continuous, modulated enteral administration via a portable pump. The typical approach involves a percutaneous endoscopic transgastrostomy jejunostomy (PEG-J), which requires a combination of procedures designed to ensure that no organ is interposed between the abdominal wall and the gastric surface. Lack of transillumination in maximal endoscopic light settings is a major contraindication for PEG-J, and we decided to use a different approach to establish enteric access for long-term medication delivery via pump, using a minimally invasive procedure.

Methods: In all patients, we performed a laparoscopic-assisted percutaneous transgastrostomy jejunostomy (LAPEG-J) after an unsuccessful endoscopic transillumination.

Results: Five patients with end-stage Parkinson disease were referred to our department after successful therapeutic testing with administration of levodopa/carbidopa via naso-jejunal tube. All patients failed the endoscopic transillumination during the endoscopic procedure and were considered for LAPEG-J. In all patients, the LAPEG-J procedure was uneventful. The most common reason identified for failed transillumination was a high position of the stomach, followed by interposition of the liver or colon between the stomach and anterior abdominal wall. There were no complications regarding the LAPEG-J procedure,

and all patients were discharged during the second post-procedural day.

Conclusions: LAPEG-J provides a simple and safe option for placing a jejunostomy after an unsuccessful PEG-J attempt.

Key Words: LAPEG-J, Laparoscopy, Parkinson disease.

INTRODUCTION

Long-term jejunal access is required in a variety of clinical situations, but in most it is used for enteral feeding. Direct enteral administration of medication is an advanced therapeutic solution in end-stage Parkinson disease, a situation in which the benefits exceed the disadvantages of a permanent jejunostomy and pump.

There are numerous data showing a significant improvement in symptom control when using an enteral pump-delivered levodopa/carbidopa combination.¹ This mixture, formulated as a gel suspension, must be delivered enterally to prevent gastric destruction of the medication, and the use of a computer-controlled pump allows for a permanent accurate dosage with modulation of the dose according to activity and clinical status. This procedure results in less variability in levodopa concentrations and fewer motor fluctuations and dyskinesias.¹

Nevertheless, continuous administration requires long-term enteral administration via a minimally invasive procedure that implies a jejunostomy. In most cases, the jejunostomy tube is placed through an endoscopically assisted gastrostomy (percutaneous endoscopic transgastrostomy jejunostomy [PEG-J]). Although a simple endoscopic procedure PEG—a first stage in percutaneous endoscopic jejunostomy (PEJ)—is a partially blind technique that requires direct placement of a trocar in the gastric lumen through the abdominal wall. Transillumination is mandatory for the safety of the procedure, because it minimizes the risk for an additional organ to be interposed and thus become injured. Complications associated with PEG placement can be severe and cannot be completely

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avoided despite accurate techniques.² Some authors describe the use of laparoscopy-assisted PEG (LAPEG) if PEG is not feasible, whereas others advocate this approach in all cases. The logic is to transform a blind technique in a safer procedure, where needle introduction can be visually monitored and correct placement of the PEG can be decided based on laparoscopic evaluation of anatomic relative positions.³⁻⁵ The most important drive is to maintain the advantages of PEG in cases for which enteral access is mandatory and the only alternative would be an open surgical procedure.

We describe herein our experience with five cases in which PEJ was considered impossible and a LAPEG-J was successfully performed for patients with end-stage Parkinson disease. Indications, technical aspects, and outcomes are also discussed through a review of the literature.

MATERIALS AND METHODS

During a period from January 2011 to December 2014, a series of 35 patients with end-stage Parkinson disease were referred to our department and required jejunal access for levodopa/carbidopa mixture intrajejunal infusion (Duodopa, Abbott Laboratories, Abbott Park, Illinois). From this group, five patients (3 men and 2 women) from 49 to 56 years of age presented with major contraindications for standard PEG-J, and a modified LAPEG-J procedure was indicated. All were diagnosed with end-stage Parkinson disease refractory to standard therapeutic protocols, which rendered them unable to lead an independent daily life. The initial reference was to our outpatient endoscopic unit for the placement of a naso-jejunal feeding tube as part of the protocol for therapeutic testing with the aforementioned levodopa/carbidopa mixture as a pulsed intraduodenal/intrajejunal infusion.

Patients were examined under local anesthesia and slight sedation (propofol). The feeding tube was inserted into the stomach through the right nostril and was followed immediately by the endoscopic procedure that guided the tube into the third part of the duodenum. Positioning was ensured by retraction of the guide wire with subsequent coiling of the tube. Part of the procedure was to test for transillumination at the maximum endoscopic light setting, anticipating a PEG-J technique. Failure to transmit light was considered an absolute contraindication for standard PEG-J.

Patient admission followed after a short therapeutic trial, when both the consultant neurologist and the patient considered the results to be very good, the latter experi-

encing a significant freedom of movement and a major alleviation of neurologic symptoms. Because a standard PEG-J was contraindicated, we offered patients the alternative of having the procedure done laparoscopically, which could potentially overcome problems related to anatomic positioning and allow for a correct PEG-J placement under direct visual control. The patients were fully informed of any potential complications of the operation and their consent was direct proof of the major neurologic improvement during the trial period.

The procedure was scheduled within one week without special preoperative preparation, except for overnight fasting. The patients were placed in the lithotomy position, and the procedure was performed under general anesthesia with oro-tracheal intubation. A pneumoperitoneum was induced using the closed technique, and the optic trocar was introduced using a 10-mm incision in the upper part of the umbilical scar. A second 5-mm port was introduced into the left upper quadrant in cases where organ displacement was necessary (ie, colon, omentum, liver) to accommodate an atraumatic grasper. The abdominal cavity was fully explored and a videogastroscope was inserted, followed by full inflation of the stomach, for a better evaluation of relative position related to the abdominal wall. Anatomic causes for failed transillumination are presented in **Table 1**, and it is obvious that organ interposition was correctly evaluated in preoperative settings. We were unable to find any relationship between transillumination failure and Parkinson disease.

Although the main part of the stomach projected over the thoracic wall in patients 1 through 3, the procedure was considered feasible after down-traction of the antrum and controlled inflation of the stomach, which brought the stomach in contact with the abdominal wall.

A standard percutaneous gastrostomy was completed under direct visual control through a trocar inserted at the junction between the horizontal and vertical parts of the stomach. With a rendezvous technique, the procedure was continued endoscopically. Laparoscopy allowed for a good observation of the apposition of the stomach wall to the abdominal wall, which appeared to be under slight tension but became loose as we decompressed the abdominal cavity. Good contact was documented before complete carbon dioxide evacuation. After completion of PEG, a pigtail catheter was introduced over a metallic guidewire and was endoscopically guided into the third part of the duodenum. The guidewire was retrieved and the catheter was released under endoscopic control (**Figure 1**). There were significant technical difficulties

Table 1.
Anatomical Causes for Failed Transillumination

Patient	Age	Sex	Cause of Transillumination Failure	Trocars Used
1	65	M	Abnormally high position of the stomach, transverse colon interposition, left liver interposition	10 mm, 5 mm
2	49	F	Abnormally high position of the stomach, transverse colon interposition, dense abdominal scar after a burned injury	10 mm
3	58	F	Abnormally high position of the stomach	10 mm, 5 mm
4	56	M	Left liver lobe interposition	10 mm, 5 mm
5	56	M	Transverse colon interposition	10 mm

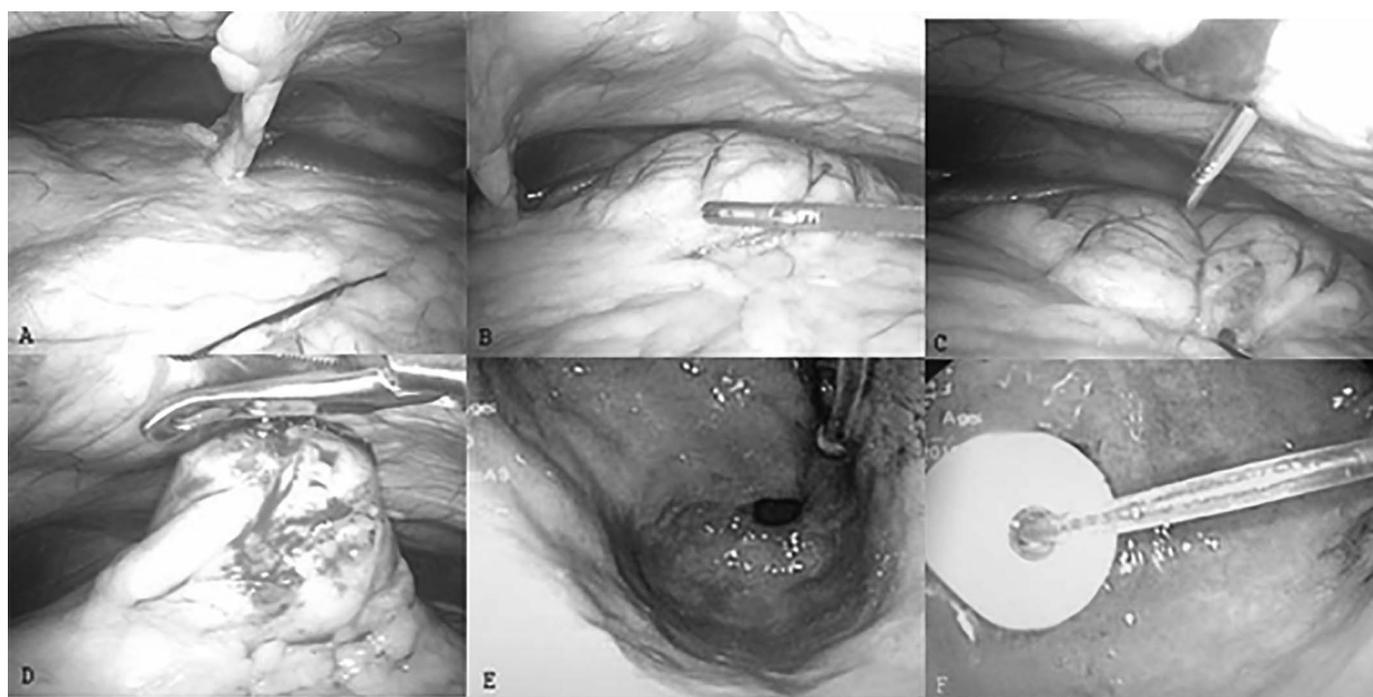


Figure 1. Steps in LAPEG-J procedure. A, Laparoscopic view: high position of the stomach and dense omentum interposed; B, controlled inflation of the stomach toward the abdominal wall; C, gastric puncture under visual control; D, insertion of the bumper and approximation of the stomach to the abdominal wall; E, endoscopic view of the jejunal tube inserted through the pylorus; F, endoscopic view of the PEG bumper with the transgastrostomy jejunum tube.

in the endoscopic manipulation, because the initial PEG produced an angulation of the stomach. Postoperative recovery was swift, and patients were discharged to neurologic care early the next day. There were no complications regarding the PEG-J procedure, except for one case in which an intermittent gastric volvulus developed in one patient, but that was efficiently managed with dietary modification. For all of our patients, postoperative recovery was swift and the patients were discharged on the first postoperative day with ambulatory control for levodopa/carbidopa dose adjustments.

DISCUSSION

For most indications, enteral access was used for enteral feeding and surgical gastrostomy was commonly the procedure of choice. The PEG was first introduced in 1980 by Gauderer in the pediatric population.⁶ Since then, PEG has been widely accepted and remains the most common form of gastrostomy. Although PEG is most commonly performed for enteral feeding, PEJ is preferred to avoid the complication of aspiration pneumonia that is associated with gastrostomy tube placement and enteral feeding.

Table 2.
Complication After PEG/PEJ

Major Complications	Frequency (%)	Minor Complications	Frequency (%)
Aspiration	0.3–1.0	Ileus	1–2
Peritonitis	0.5–1.3	Peristomal infection	5.4–30
Necrotizing fasciitis	Rare	Stomal leakage	1–2
Hemorrhage	0–2.5	Buried bumper	0.3–2.4
Tumor implantation	Rare	Gastric ulcer	0.3–1.2
Death	0–2.1	Fistulous tract	0.3–6.7

Adapted from Rahul et al.⁶

The most common indication for PEG-J is advanced Parkinson disease. Long-term enteral administration requires a minimally invasive procedure that implies a jejunostomy tube through an endoscopically assisted gastrostomy (PEG-J).

Continuous dopaminergic delivery with levodopa/carbidopa intestinal gel is effective in producing a more stable plasma level and thus reducing both motor and nonmotor deficits in advanced Parkinson disease, whereas sleep disturbances and urinary problems seem to improve.^{1,7} Because the mixture becomes unstable when in contact with gastric acid, an enteral route is necessary for both therapeutic testing and long-term drug administration. In most cases, a standard PEG-J is the best choice, except for unusual anatomic conditions in which transillumination is impossible because of organ interposition or abnormally high gastric position renders PEG impossible.⁸

Complications associated with PEG/PEJ placement can be severe and cannot be completely avoided despite use of an accurate technique (**Table 2**).⁹ Although some unusual complications are inherent to the technique (eg, buried bumper, fistulous tract), peristomal infection is the most frequent complication (some authors describe the frequency of peristomal infection to be as high as 30%) and more likely to occur in immunosuppressed patients who did not receive antibiotic prophylaxis and if the general rules of asepsia and antisepsia are not strictly enforced.¹⁰ Nevertheless, a break in safety measures (failure to produce transillumination) can lead to peritonitis or intraperitoneal bleeding.

Laparoscopic gastrostomy was first used in 1991 by Edelman and Unger in an attempt to reduce complications related to PEG placement tubes secondary to unfavorable anatomy.¹¹ Since then, the technique evolved and transformed into LAPEG, which was first performed by Stringel et al in 1995.¹²

LAPEG-J is an excellent alternative option for placing gastrostomy/jejunostomy tubes when the percutaneous method fails. Typical conditions include: interposition of the colon, omentum, or liver between the stomach and anterior abdominal wall; a high (intrathoracic) position of the stomach; previous gastrectomy or peritoneal adhesions secondary to surgery; obesity; hiatal hernia; severe scoliosis; intraabdominal masses; or, as described in our series, a keloid scar that occupied the entire upper abdomen.

In patients with end-stage Parkinson disease, we considered LAPEG-J to be the best alternative to achieve a permanent enteral route with a minimally invasive technique. LAPEG-J offers major advantages: excellent exposure, accurate and secure placement of tubes under direct vision, possibility for mobilization of viscera, and, more so, safety, despite the disadvantages and cost increase owing to general anesthesia and prolongation of hospitalization by a day. We encountered only one small complication related to the technique: intermittent gastric volvulus, a logical side effect produced by down-traction of the stomach and anterior fixation. The benefits of LAPG-J are overwhelming in this small group of fragile patients because it can provide easy long-term enteral access with minimal discomfort and trouble-free manipulation for patients and caretakers.

Laparoscopic jejunostomy may seem a much easier approach for jejunal access, but there are some particularities in patients with Parkinson disease that made us not choose it in favor of LAPEG-J. This highly selected group of patients require lifetime jejunal access for this type of medical treatment, which implies good stability of the jejunal catheter during daily activities (with minimal discomfort) and the possibility for simple revisions for dislodged or malfunctioning assemblies. The bumper built

on the gastrostomy tube (with a jejunostomy firmly attached to it) is responsible for stability—without the need for sutures, which produces discomfort and may often become dislodged. We need to keep in mind that this group of patients has problems with movement coordination, and a simple jejunostomy can easier be dislodged, causing a treatment break. Long-term use of both gastrostomy and jejunal tubes reveals another problem related to wear off changes due to structural damages to the material. We have encountered such problems even after one year of usage, with tubular parts becoming brittle and breaking. Other small accidents, such as obstruction or inadvertent retraction of the jejunal catheter, also require a change of the PEG-J assembly. Unlike a simple jejunostomy, PEG access makes replacement very easy as an endoscopic outpatient procedure, offering the alternative to replace the whole assembly or just the jejunal catheter. We expect that every patient will require such a revision at least once every 3 to 5 years.

CONCLUSIONS

LAPEG-J provides a simple, safe option for placing a jejunostomy after an initial unsuccessful transillumination attempt. Therefore, when conventional PEG/PEJ placement is not possible, LAPEG-J placement should be considered as a time-efficient, minimally invasive alternative to surgical jejunostomy.

References:

1. Nyholm D, Lewander T, Johansson A, et al. Enteral levodopa/carbidopa infusion in advanced Parkinson disease: long-term exposure. *Clin Neuropharmacol*. 2008;31(2):63–73.
2. Schrag SP, Sharma R, Jaik NP, et al. Complications related to percutaneous endoscopic gastrostomy (PEG) tubes. A comprehensive clinical review. *J Gastrointest Liver Dis*. 2007;16(4):407–418.
3. Takahashi T, Okazaki T, Kato Y, et al. Laparoscopy-assisted percutaneous endoscopic gastrostomy. *Asian J Surg*. 2008;31(4):204–206.
4. Croshaw RL, Nottingham JM. Percutaneous endoscopic gastrostomy (PEG) replaced open surgical gastrostomy (OSG) as the preferred laparoscopic-assisted percutaneous endoscopic gastrostomy: its role in providing enteric access when percutaneous endoscopic gastrostomy is not possible. *Am Surg*. 2006;72(12):1222–1224.
5. Charlesworth P, Hallows M, van der Avoirt A. Single-center experience of laparoscopically assisted percutaneous endoscopic gastrostomy placement. *J Laparoendosc Adv Surg Tech A*. 2010;20(1):73–75.
6. Gauderer MW, Ponsky JL, Izant RJ Jr. Gastrostomy without laparotomy: a percutaneous endoscopic technique. *J Pediatr Surg*. 1980;15(6):872–875.
7. Bredberg E, Nilsson D, Johansson K, et al. Intraduodenal infusion of a water-based levodopa dispersion for optimisation of the therapeutic effect in severe Parkinson's disease. *Eur J Clin Pharmacol*. 1993;45:117–122.
8. Prosser B. Common issues in PEG tubes—what every fellow should know. *Gastrointest Endosc*. 2006;64(6):970–972.
9. Sharma VK, Howden CW. Meta-analysis of randomized, controlled trials of antibiotic prophylaxis before percutaneous endoscopic gastrostomy. *Am J Gastroenterol*. 2000;95:3133–3136.
10. Barkmeier J, Trerotola S, Weibbke E, et al. Percutaneous radiologic, surgical endoscopic, and percutaneous endoscopic gastrostomy/gastrojejunostomy: comparative study and cost analysis. *Cardiovasc Intervent Radiol*. 1998;21:324–328.
11. Edelman DS, Unger SW, Russin DR. Laparoscopic gastrostomy. *Surg Laparosc Endosc*. 1991;1(4):251–253.
12. Stringel G, Geller ER, Lowenheim MS. Laparoscopic-assisted percutaneous endoscopic gastrostomy. *J Pediatr Surg*. 1995;30(8):1209–1210.